SCIENCE.

FRIDAY, MARCH 27, 1885.

COMMENT AND CRITICISM.

If our confidence in posterity be not misplaced, it will look with peculiar interest upon the hobby-horses of our day, particularly those used by some persons, with many external claims to consideration, in their raids upon physiologists and their work. One of these animals has recently been ridden in an attack upon a deceptive figure which was labelled with the name of Professor Martin of Johns Hopkins university. The arena as well as the figure, which, of course, was demolished, was furnished by the *Zoophilist*, falsely so called, — a journal supported by some antivivisection societies in England. But the real Professor Martin has come upon the scene with a little pamphlet, which is not only a 'correction,' but a severe 'castigation' and an 'appeal,' as its sub-title tells us.

During some nine years, Dr. Martin has been the esteemed head of the department of biology in Johns Hopkins university. Both by him, and by enthusiastic pupils working under his direction, many interesting researches have been undertaken, and some very important results have been obtained. One of the most valuable 'finds' is an admirable method for the study of the mammalian heart, isolated from all the influences of the body. This method involves the killing of the entire animal, except the heart and the lungs, which are needed for the artificial aeration of the blood. With the exception of the brief period required for administration of the narcotic or anaesthetic, the entire procedure is painless. The only possible exception is found in two instances where curare was used to exclude and control the action of the narcotics usually employed; and here the period of possible pain is very brief, lasting only until the blood-supply to the brain can be cut off. These experiments are not merely of the greatest theoretical interest, but their practical importance is immense and far-reaching. Already it has been possible to determine that fever temperatures of the blood are alone sufficient to act powerfully upon the heart, and alter its work. The hope which this form of study holds out, not only of increasing our understanding of the heart's action, but also of giving us much exacter knowledge of the action of drugs upon that organ, and the great value of such knowledge, must be evident to every candid person.

The Baltimore investigations have all been published in detail: no secret has been made of the method, and the work has had all the publicity which the ordinary channels open to such communications permit. The *Zoophilist* people met with one of the reports in the *Philosophical transactions* of the Royal society, and proceeded to give a garbled version, with comments, according to the method familiar to all who have read any of the peculiar writings of the antivivisectionists. This was well spiced with allusions to the barbarity permitted in 'far-off' America, and to the callousness of Dr. Martin, with 'his learned jargon and supposed results.' The reply will be found to be an honest and vigorous protest, which will have the hearty approval of every right-minded and clear-headed man. It not only gives a plain statement of the maliciousness and injustice and ignorance of his accusers, whose lies he numbers as he nails them, but it also contains a manly appeal to those among whom he has worked and taught, to stand by him, to protect him and others from this form of abusive misrepresentation; and he appeals, furthermore, to the officers and committee of the society, whose mouthpiece the *Zoophilist* is said to be. The list contains many names of those in good repute and in high places (there are not only ecclesiastical and courtly dignitaries among them, but, *mirabile dictu*, scientific worthies as

well); and Dr. Martin's plain declaration of the character of the work they support ought to call a blush of shame to the cheek of every one of them, unless, indeed, the disease may have already affected the vaso-motor centre.

The report of the commissioners of the Massachusetts state topographical survey for 1884 shows that the system of co-operative work with the U. S. geological survey has proved entirely successful. The work has been under the immediate control of the U. S. geological survey, but subject to the inspection of the state commissioners at every stage. Although the field-operation did not begin until midsummer, and was subject to all the difficulties of starting, an area of several hundred miles for detailed contoured maps was surveyed before the winter closed the field-work. The parties, few in number, were so placed that their work fairly represents all the varieties of topography within the state; and the results give a fair measure of the cost of a completed map on the scale of two inches to the mile, with contours at intervals of twenty feet. It appears that this cost is not likely to exceed fifteen dollars per square mile, and may be brought within twelve dollars.

The report recommends a further appropriation of three thousand dollars per annum, to be used in the determination by triangulation of the corners of the several town areas. The present system of delimiting the towns and preserving the memory of their bounds is an inheritance from former ages. It is said that in the old English days the memory of the boundaries was effectively maintained by taking all the boys of the town to the bounds, and soundly flogging them along the lines. By repeating this from year to year, the male population of the township was sure to have a lively, though perhaps unpleasant, sense of these limits. This simple method of fixing the boundaries has fallen into disuse, but as yet no more effective modern system has taken its place.

The commissioners of the Pennsylvania geological survey have stipulated with Major Powell to prosecute the survey of that state on terms similar to those arranged with Massachusetts. The plan requires an appropriation of ten thousand dollars per annum on the part of the state. If this plan is carried out, — and it is hardly conceivable that the Pennsylvania legislature will not do its part of the work, — the map of that state should be completed within ten years.

One of the greatest hinderances to the development of the United States arises from the imperfect knowledge of its surface and structure. Our modern life cleaves so closely to the earth, that at every step we need a vast amount of accurate information which our forefathers did not require. If the admirable plans of the present director of the geological survey are allowed to bear their point, by the end of this century, this hinderance may be removed; the whole surface of the national area will be mapped on a scale proportionate to the needs; and the cost of the work will not much, if at all, exceed that of maintaining a regiment of cavalry for the same time. There will be reason for sad comments on the American reputation for sagacity, if this work is not done.

Any one who has seen the results of the terrible upheaval at the south caused by the war is surprised when here and there he sees signs of returning prosperity. Knowing to how many a southerner, as he sits on his well-worn mahogany and gazes at his streaked mirror, it is the question of each day where he may obtain the meagre ration of hominy for himself he was wont to mete out to his slaves, it is actually a cause of wonder, when one hears now and then of the prosperity of some of the southern colleges, and at last of the revival of an interest in science, such as is shown by the formation of the Elisha Mitchell scientific society in North Carolina.

This society was the outgrowth of the small knot of studious men about the college at

Chapel Hill, and completed its first year of existence last autumn. In its first report it is stated to have seven life-members, seventy-five regular members, and seventy-four associates. Monthly meetings have been held in which the interest taken was encouraging. The papers published in the first numbers of the yearly report of the society are of good character, and receive much of their inspiration from the chemical laboratory of the University of North Carolina. A biographical sketch and portrait of Mitchell are prefixed.

LETTERS TO THE EDITOR.

Mr. Melville's plan of reaching the north pole.

IN the issue of the New-York *Evening post*, Feb. 6, I opposed Mr. Melville's plan of reaching the north pole,[1] as I could not consider the theory on which it is founded correct. In answer to my remarks, Mr. Melville in the same paper, Feb. 17, maintains his position, and denounces his critics for hindering his endeavors, instead of "sending him to prove his theories he has so much faith in, and permitting him to bring back the necessary facts that alone can carry conviction to the unbeliever without a theory." He says, "It would be more in the spirit of progress and the advancement of science, if my critics would propound new theories or other plans of progress, rather than simply find fault or say, '*I don't believe.*'" We cannot coincide with this opinion of Mr. Melville, and claim the full right to criticise a plan of exploration before it is set in motion. What is the cause of so many failures of arctic expeditions and other undertakings? Is it the careless neglect of thorough deliberation before entering into expeditions, or is it the hostility of nature? Have we nothing to learn by the Jeannette and the Proteus? If we should claim at any time the right of criticism, we do it now, when the blunders and misfortunes which effected the failures of the last expeditions are deeply impressed on public minds, and nearly extinguish the little interest which is left for scientific work in the Arctic. We consider it in the spirit of progress of science, to prove the fallacy of a plan founded on theories like those of Mr. Melville, which cannot be accepted by scientific men, and must lead to disaster, or will at least be unsuccessful.

It is somewhat difficult to understand Mr. Melville's theory; and I do not know that I am able to give an explanation of it which will satisfy the author. Mr. Melville supposes that the Arctic Ocean, north of 85° north latitude, is covered by a solid ice-cap kept in a state of equilibrium by the centrifugal force. He intends to start from the northern limit of Franz Josef Land on sledges, travelling over the smooth ice-cap towards the north pole, — a supposed distance of five degrees; i.e., three hundred miles out and three hundred miles back. In returning he intends to use the southern drift of the ice, which will carry him either back to Franz Josef Land or to Spitzbergen, where he would have depots erected for the use of the retiring party.

[1] G. W. Melville, In the Lena delta. Boston, 1885.

His view about the ice-cap will be seen from the following quotations (*l. c.*, p. 475): "After crossing the eighty-fifth degree of latitude, the traveller will come to that immovable ice-cap which will in all probability prove to be a palaeocrystic sea of ice and snow. We should have a clear, unbroken surface to travel upon, subject, of course, to fissures and shrinkage cracks." P. 476, he says, "The countless million square miles of ice annually expelled from the Arctic Ocean alone prove the fallacy of a 'palaeocrystic sea of ice;'" p. 478, "Let the state of the ice be as it may, it certainly can be no worse than the broken path over which the Jeannette's crew marched."

From these quotations, it would appear that Mr. Melville is not very certain of the existence of the ice-cap. The assertion, however (p. 479), that "the feat of marching to the pole and back will be easily practicable," and the fact that his plan is founded on this theory, prove Mr. Melville's confidence in it. If it can be proved that Mr. Melville's reasons for the existence of an ice-cap cannot be maintained, if it can be proved that an ice-cap cannot exist, his plan must needs fall to pieces. Let us enter into his proofs singly.

First: "As the centrifugal influence is acting equally in all directions, and tending to pull the ice-cap towards the equator, it can only carry away those detailed portions of ice broken near the outskirts of the ice-cap" (p. 474). No doubt, the centrifugal pull at a certain parallel will be equal on every meridian; but, supposing this continuous ice-cap to exist, an equal pull could only come to pass if it extended to the same parallel all around the pole. Every mile added to one side would increase the pull there, and disturb the equilibrium which Mr. Melville requires for his theory. Besides, we cannot imagine any kind of ice strong enough to stand the immense tension effected by the centrifugal force on a solid body of three hundred miles in radius. An approximate computation of the effects of the centrifugal force on a body of ice of three metres' thickness, extending from latitude 85° to 86°, gives a tension of nearly thirty kilograms on one square centimetre.

As soon as Mr. Melville will grant us the slightest motion of his ice-cap in any direction, he has to give up his theory, as the "nucleus of pointed island peaks, which, if nothing more, will hold the ice fast at the pole" (p. 474), will not any longer hold the cap, but break it up into an immense pack. I suppose Mr. Melville will concede that his arguments referring to an equal pull by the centrifugal force cannot be maintained.

The hydrographical and meteorological theories which he brings forth in favor of his plan cannot be supported from the present state of our knowledge in these sciences.

He supposes that there are two currents, — an equatorial, setting north; a polar, setting south, — and between both a neutral zone which he supposes at about 85° north latitude, where scarcely any current exists. Considering the observations on currents in the polar seas, we cannot understand how Mr. Melville can propound such a theory. This is not the place to treat of modern oceanography; and I can only refer to Thomson's and Carpenter's works, and to Zöppritz's mathematical theory of currents, which give a basis to this science not allowing us to form theories like Mr. Melville's. We may only be permitted to say a few words about the improbability of symmetrical currents such as Mr. Melville supposes. The Arctic Ocean forms a large Mediterranean Sea, with one wide outlet between Greenland and Norway. The exchange of water between the Arctic and the

Equatorial Ocean must be affected through this strait, as the narrow and shallow Bering Strait cannot have any influence on this system of currents. No warm current forms there a 'thermometrical gateway' to the pole. The surplus of water annually added to the arctic sea must take its way through the strait between America and Europe. In its eastern portion, between Iceland and Norway, the warm current reaches to the comparatively shallow bottom of the sea (see Mohn's researches in *Petermann's mittheilungen*). North of the submarine elevation connecting Iceland and Norway, which nowhere exceeds four hundred fathoms in depth, the cold water of the arctic sea is dammed up: so the northern current has to pass the narrow Denmark Strait between Iceland and Greenland. Here we observe the immense ice-laden current following the coast of East Greenland. Through this strait the deep-sea motion towards the equator must take its way, as not a drop of cold water passes east of Iceland. The cold water rising at the equator can pass only this way. But, from the present state of our knowledge, we do not yet know whether the greater part is carried along by the deep-sea motion, or by the superficial current. The fact is, that the polar ocean is an immense Mediterranean Sea, with one outlet, through which the surplus of water has to find its exit: therefore the whole area near the outlet must be moved by strong currents; while the remote parts, the sea between the Parry archipelago and North Siberia, will only be affected by the prevailing winds. If there were no other reason, this would be sufficient to prove the impossibility of symmetrical currents around the poles.

As for Mr. Melville's meteorology, I confess that I cannot undertake to refute his theory at this place, as I should have to fall back on the elements of this science and those of physics. "And as they [the air-currents] *do* follow the earth's surface, they take their direction toward the pole, following the spherical surface of the earth until they reach the shoulders of the ellipsoid, where the flattening of the earth commences (!); then, having received their course and direction for a distance of nearly five thousand miles, they follow their *projected direction*, and continue on above the earth's surface just as much as the flattening of the earth at the poles amounts to." (!) I should be glad to learn the place where the earth begins to flatten! Mr. Melville's assertion that a low atmospheric pressure exists in high latitudes is not correct. The centres of low pressure are the Bering Sea and the North Atlantic Ocean around Iceland. Besides, regions of a low barometer are not those of calms, but of winds.

In short, Mr. Melville's theory cannot uphold itself, and a plan founded upon it cannot prove successful. We wish Mr. Melville might confine himself to the principle that every plan of advance towards the pole should be made according to former experiences, not vague theories. We hope he will succeed in reaching Franz Josef Land, and there, no doubt, he will find most interesting results; but we oppose the hazardous undertaking of leaving the land in order to reach the pole. From the experience he will gain in the far north, he may propound a new plan founded upon his own observations there.

We think the enthusiasm of Mr. Melville for arctic researches is highly to be praised. If any thing can encourage the public, it is the struggle of the arctic heroes for their noble task, the perseverance with which they brave the dangers of climate and ice, as well as the narrow-minded opponents who scorn their ideals. We hope Mr. Melville does not class us among these. We have the most hearty interest in polar exploration, and only wish Mr. Melville might save his life and his experience for an expedition not so hazardous and not so adventurous as the proposed one.

Dr. Franz Boas.

Did Cortez visit Palenque?

This interesting question, propounded by Professor Cyrus Thomas in *Science*, v. p. 172, should attract the attention of archeologists.

As there are some inaccuracies in his statements, and as, from a study of the documents in the case, I reach different conclusions, I beg to submit them to your readers.

The locality 'Titacat' was not reached *after* the execution of Cuauhtemoctsin (as Professor Thomas says), but was the station next previous to the one at which that event occurred; to wit, at Izancanac, the capital city of the province of Acalan.

As to this name 'Izancanac,' it is evidently in the Maya language, and means 'the residence of the chief of the Itzas,' who were a well-known Maya tribe. The province of Acalan is placed, on old maps, on the southern and eastern shores of the Bahia de Terminos; and, according to Cortez, its chief city was on or near the shores of this bay.

When at Zagoatespan, between which and Izancanac the only stations were Teutiaca and Tizatepelt, Cortez sent a messenger by sea to Acalan: hence both these places were on the seacoast, or near it. At Zagoatespan he was informed that there were two roads to Acalan, — one up the country; the other, shorter, near the seashore. He followed the latter, having to pass through extensive marshes, and to cross an arm of the sea (Estero, ô Ancon) over five hundred yards wide, and from four to six fathoms in depth. A day and a half's journey from this was Tizatepelt, the first town in the province of Acalan; and five leagues from it was Teutiaca, from which Izancanac was less than a day's journey.

This plain statement shows, beyond all question, that Cortez' route lay nowhere near Palenque, and that those who place it there cannot have traced it out according to his own notes in his celebrated 'fifth letter.' It was close to the seacoast, and quite far from those celebrated ruins.

As for his description of the temples of Teutiaca, he represents Izancanac as a much larger city, with more temples, and altogether a greater place (*muy grande y de muchas mezquitus*).

D. G. Brinton, M.D.

Mammalia in interglacial deposits.

May I be permitted to ask aid from some American contributor to *Science* who follows the lore of glacial geology? I learn that some American glacialists are satisfied that there have been two periods of glaciation, and I would inquire whether the interglacial deposits contain, like those of Switzerland, remains of mammalia, and, if so, what they are. Any reference to American evidence on these points would oblige

W. S. Symonds.

The Camp, Sunningdale, Eng., Feb 27.

Colored stars.

The planet Jupiter and the star Regulus (*a* Leonis) just now are so situated as to give us a fine example of a naked-eye colored double star, and strikingly illustrate the optical effect produced by two neighboring stars of very different magnitudes. The component colors, as they appear to the writer this even-

ing (March 11), are, Jupiter, yellow; Regulus, blue. The naked-eye view is very similar to the double star β Cygni, when seen with a power of about one hundred. Struve calls the color of Regulus bluish white; but its color now appears decidedly blue, or greenish blue. S.

Acquisition in infants.

I recently tried teaching Constance A., twelve months old, to ring a common dome table-bell. Perceiving the little knob on top to be somehow concerned, she fingered it clumsily, but could not learn to strike down on it accurately with her raised hand, though I forced her to do so many times. She made clumsy motions, but finally, half accidentally, she rang it. This was enough. She at once rang it repeatedly with great success. I took it away to test her memory, and the next morning she rang it immediately without suggestion, but had it for a moment only. She was then absent four days: on returning, she rang it at once. C.

Devonian strata in Montana.

The following note is written simply to place upon record the first positive identification of Devonian strata in the Rocky-Mountain region of Montana.

In 1872 the Hayden survey brought in, from several localities in the territory, collections of fossils, consisting mainly of separate valves of brachiopods embedded in a hard limestone. They were examined by Prof. F. B. Meek, who found that the species were mostly new, and that the genera represented were, without exception, common to both the carboniferous and Devonian, while a small proportion was also represented in the Silurian. In Hayden's sixth annual report, p. 432, Professor Meek says, "Some of the Producti, Chonetes, and Spirifer have rather a Devonian look, while a very finely striated Hemipronites is very similar to some of the Devonian types of that genus. Even the form I have referred to, H. crenistria, is quite as nearly like some varieties of H. chemungensis (Streptorhynchus chemungensis, of the fourth volume, Paleont. New York), from the Chemung and Hamilton groups of the New-York Devonian, as it is like the carboniferous forms of H. crenistria." However, notwithstanding the resemblance of the fossils to Devonian forms, he regarded the whole collection as belonging to the lower part of the carboniferous, as it contained no strictly Devonian types of corals, crinoids, or lamellibranchs. He at the same time stated his belief that they were referable to a lower horizon than the other carboniferous collections brought in from adjacent portions of Montana at the same time. The specimens examined by Professor Meek were mainly from the mountains on the south, east, and north sides of the Gallatin valley. During the summer of 1884, the writer, in company with Dr. F. V. Hayden, had occasion to revisit a portion of this area. In a section made at a point four or five miles north-west of Hamilton, running north-westwardly from the Gallatin River, a collection of fossils was obtained from beds which at the time were supposed to be of lower carboniferous age, and which were colored carboniferous on the geological map made in 1872. Upon returning from the field, the specimens were submitted to Mr. Charles D. Walcott of the geological survey, who identified them as undoubtedly Devonian. The following lists were prepared by him. List No. 2 includes some specimens obtained from a locality three or four miles north-east of the point from that where those in the first list were found.

Devonian fossils from north-east of Gallatin River, Montana.

LIST No. 1. — Discina lodensis Hall (?); Streptorhynchus chemungensis Conrad; Orthis Vanuxemi (?) Hall (?); Chonetes mucronata Hall; Productus lachrymosus, var. limus Conrad; Productus speciosus; Spirifera disjuncta Sowerby; Spirifera Engelmanni Meek; Rhynchonella pugna Martin; Rhynchonella sinuata Hall; Rhynchonella tethys Billings (?); Atrypa reticularis Linnarsson; Ambocoelia umbonata Conrad; Athyris hirsuta Hall; Athyris sp. (?); Aviculopecten; Grammysia, 3 sp.; Modiomorpha; Nucula; Schizodus.

LIST No. 2. — Streptorhynchus chemungensis Conrad; Spirifera sp. (?); Rhynchonella Horsfordii Hall (?); Athyris hirsuta Hall.

Mr. Walcott says, "Of the twenty-three species of fossils given in lists 1 and 2, twelve are identical with species occurring in the upper Devonian of the Eureka district, Nevada: of the others, two are upper Devonian species in New-York state, and Athyris hirsuta occurs at the base of the carboniferous, in the Eureka district. There is also a species of Athyris too imperfect for determination. The remaining forms are lamellibranchs belonging to five genera; and the species closely resemble those of the lower carboniferous, of the Eureka district." The latter were obtained from the upper portion of the bluff from which the specimens were obtained.

A. C. PEALE,
U. S. geological survey.

The Hall effect.

About a year ago Mr. Shelford Bidwell published a table intended to show that the direction of the magnetic rotation of the equipotential lines of an electric current in any given metal could be inferred from the sign of the effect produced by stress upon the thermo-electric property of the metal.

Although Mr. Bidwell's attempted explanation of the former effect by means of the latter has proved entirely inadequate, the table published is nevertheless interesting and suggestive. It appears, however, that the law indicated in this table is not perfectly general. Mr. Coggeshall and Mr. Stone of the present Harvard junior class, working with my co-operation at the Jefferson physical laboratory, find that French cold-rolled steel would form an exception in Mr. Bidwell's table, acting in the thermo-electric test like copper, but in the other test like iron. Their examination of copper and iron confirms Thomson's results with those metals, and, as a necessary consequence, Mr. Bidwell's table.

The students have examined only these three metals as yet, but will probably extend their investigation to others. E. H. HALL.

Cambridge, March 20.

P.S. — We have now taken a strip of aluminium, cut two pieces from it, and tested one of these pieces for the transverse effect, the other for the thermo-electric effect. The transverse effect is like that in copper. This agrees with the result of my previous examination of aluminium, but does not agree with the result obtained by Mr. Bidwell. The thermo-electric effect was like that in iron. This does agree with the result found by Mr. Bidwell. Hence this specimen of aluminium, which is not the same that I originally used, makes another exception in Mr. Bidwell's table. E. H. H.

JOHN BLOOMFIELD JERVIS.

The subject of this sketch, one of the most eminent of American engineers, died at Rome, N.Y., Jan. 12, 1885, after a long life, distinguished for the prominent enterprises with which he had been connected and to which he had given many features they still retain. He was noted for his purity of life, and professionally for his caution, accuracy, sound judgment, and integrity. His engineering training was not obtained in any technical school, such as is offered to the youth of the present day, and his preparatory education was extremely moderate in amount.

John Bloomfield Jervis was born at Huntington, Long Island, Dec. 14, 1795, and was the oldest of seven children. His father was a carpenter, who in 1798 removed to the neighborhood of Rome, N.Y., and engaged in sawing lumber. The son attended the common school of that date until he was fifteen years old; and for the following seven years he worked at the saw-mill, on the farm, and in the woods. In 1817 the construction of the Erie canal through that region brought about his employment as axeman on the work, and first turned his attention to engineering. He was soon promoted to rodman, and in two years was made resident engineer of a section of seventeen miles, from Canastota to Limestone Creek. He gave such satisfaction that in 1821 he was assigned to a similar position near Amsterdam, and was retained, after the opening of the canal, to superintend repairs.

A condensed statement of the more important of his professional engagements, which are described at greater length in the *Railroad gazette* of Jan. 23, will give an idea of how active and responsible a position in life he has occupied. In 1825 he became chief engineer of the Delaware and Hudson canal company, and remained until 1830. He constructed the inclines of the Carbondale railroad, and ordered from England the 'Stourbridge lion,' the first locomotive imported into this country. In 1830 he was made chief engineer of the Albany and Schenectady railroad, the first railroad constructed in the state of New York, and, later, of the Schenectady and Saratoga railroad. Here he devised the four-wheeled, swivelling or 'pony' truck used for the leading wheels of a locomotive, and generally adopted in this country. In 1833 he was chief engineer of the Chenango canal, ninety-eight miles in length, with a hundred locks, where he originated the use of artificial reservoirs for the supply of the summit level. In 1835 he made surveys and estimates for an enlargement of the eastern section of the Erie canal. He was made chief engineer of the Croton aqueduct in 1836, — a work considered, at the time of its completion, as a magnificent example of hydraulic engineering, and in which the Croton dam, High bridge, and the 42d-street reservoir show his professional skill. From 1846 to 1848 he was consulting engineer on the Cochituate aqueduct, Boston water-supply. Water-works at Port Jervis and at Rome, N.Y., were later constructed under his supervision. Between 1847 and 1850 he was first chief and then consulting engineer of the Hudson-River railroad when it was completed from New York to Poughkeepsie, a portion covering most of the difficult work of that line. After a short trip to Europe, he became chief engineer on the construction of what is now the western part of the Lake shore and Michigan southern railroad, and was connected with this road until 1858. During 1851 he was made president of the Chicago and Rock Island railway. In 1861 he became general superintendent of the Pittsburgh, Fort Wayne, and Chicago railway; in 1864 was made its chief engineer, and in 1866 its consulting engineer, — a position he held until 1872. In 1868 he was connected with the organization of the Rome iron-mill company, and was its secretary from 1872 until his death.

After retiring from active work in the field in 1866, he wrote a book on 'Railway property,' and another on 'The question of labor and capital.' In 1868 the American society of civil engineers elected him an honorary member, and in 1878 Hamilton college conferred on him the degree of LL.D. Mr. Wil-

liam P. Shinn, in the sketch of his life in the *Railroad gazette*, says, "His last professional work, and that which most fully illustrates the extraordinary character of his professional ability, and the esteem in which he was held by his engineering contemporaries, was his employment as a consulting engineer on the proposed new Croton aqueduct. . . . That he should be equal to this work at the age of eighty-six was sufficiently remarkable; but that he should be considered as worthy of being consulted by men themselves veterans in the profession, is a still more extraordinary evidence of the exceptional character of the man."

His health and his faculties remained unimpaired till near the close of his life; and he died of old age, in his ninetieth year.

THE NEW PALACE AT SÖUL.

SUCH is the name of that collection of grounds and buildings in Söul which is at present the abode of the reigning sovereign of Korea. Strictly speaking, the title is in both parts a misnomer: for the place so called is neither new, nor is it exactly what in western parlance would be styled a palace; and yet to Korean thought it is both. Its age is comparative merely, as indeed must be that of every thing which does not contain within itself a term of life. In this case, the comparison is with what is now known, in the same antithesis, as the Old Palace. But there is also a certain absolute justice in this last name; for the Old Palace could not possibly be any older where it is. It is coeval with the beginning of the present state of things, dating from the founding of the city of Söul, now hard upon the five-hundredth anniversary. The New Palace was laid out some hundred years later, and is therefore about four centuries old at the present time. In consequence of being later built, it occupies a somewhat less honorable position than the older one; for even position has its allotted ceremonial in Korea. North, east, west, and south, — this is the relative rank of the four cardinal points. In etiquette the sovereign always faces the south, and his subjects look to the north. Following the same rule, the post of honor generally, on all occasions of ceremony, such as dinners or feasts, is at the northern end of the room. A singular practice this, of determining by exterior terrestrial phenomena the etiquette of entertainments carried on within four walls, which are themselves in no wise subjected to orientation, and may face any direction indifferently, according to the fancy of the owner.

When the city of Söul was laid out, therefore, the palace was given the post of honor, — the northern end of the space enclosed by the city's wall; and, when the second palace came to be built, it was placed as nearly north as was possible consistently with the position of the older one, to whose left, reckoned as facing the city, it lay.

Exactly what was the origin of this custom of allotting a rank among themselves to the cardinal points, it would be interesting to know. We may, perhaps, look to some rude astronomy for an explanation. Like the pyramids, it may, in its way, be the relic of an old study of the stars. Certainly early man could hardly fail to be struck by the sight, that, while all else in the heavens moved, the pole alone remained in dignified repose. The Koreans themselves suggest a more earthly origin for the practice. Because the south is the bright, the warm, and therefore the happy, region of the earth, they say, the king sits so that he may always face it. When we call to mind the cold winters of those lands whence the far-eastern peoples migrated, as well as those to which they afterwards came and now inhabit, we realize how instinctive this turning in body, as in thought, toward the south, would naturally be.

The New Palace was originally built as a residence for the crown prince, or, to speak more accurately, the heir apparent; for in Korea the heir to the throne is chosen by the king during his life, and is not necessarily born to the position, though it is customary for his majesty to so designate his eldest son. This is no doubt a reason for the superiority, architecturally, of the other, the older one. But the newer possesses a charm of its own, first from the uneven character of the ground over which it rambles, and secondly from being much less artificially laid out. It is also somewhat the larger of the two in the extent of ground it covers. The high wall which surrounds it encloses about ten thousand acres. In this wall are set gates at various points, fourteen of them in all. There is no symmetry in their arrangement; nor is there any in the line of wall itself, which meanders about in so aimless a fashion as to cause surprise when at last it ends by meeting itself again. The gates, or archways, are quite as various in size and honor as they are unsymmetrical in position, — a fact typified by their names, which range through

all the grades of esteem, from that of 'the gate of extensive wisdom' to 'the moon-viewing gate.' The fourteen are only outer gates; within are innumerable others; and no gate is without a name. Sometimes the names are simply aesthetic; sometimes they are moral sentiments taken from Confucianism. The inner life of the people is so entirely in theory only a mixture of the two ideas, — the good and the beautiful, — and the veneration for a name so universal, that there is no structure above the most ordinary kind but has its distinct ennobling proper name.

LOTUS-POND AT THE NEW PALACE IN SÖUL, KOREA.

Then, as to thes econd half of the title, — the term a 'place.' The place is not so much a palace as a collection of palaces. Within is a very labyrinth of buildings, courts, and parks. There are audience-halls for the king and the heir apparent; then the separate palaces in which they respectively live; then the queen's apartments, whose size may be imagined from the several hundred court-ladies of various positions, who are constantly in attendance upon her, and whom no male eye save his Majesty's is ever permitted to see. Each of these sets of houses is approached by its own series of courtyards and dependent buildings.

But perhaps the chief beauty of the spot lies in the grounds, half gardens, half parks, which occupy the space not otherwise built over. It is a peculiarity of the far east that the domestication of nature — to use a term which seems best to express the artificial shaping of nature to man's private enjoyment — is carried to the happy halfway point between the two extremes common with us, and which are represented by the park on the one hand, where we shape very little, and the flower-garden on the other, where we mould a great deal too much. The grounds that a Korean delights to wander through are an adaptation or a copy of the features of a real landscape, reduced to a convenient scale, or left of the natural size, according to circumstances, and introduced where he desires them to exist, but are in no sense the conventional museum style of arrangement we display in the fashioning of our flower-gardens. Nothing would strike them as more inartistic than a collection of plants, however beautiful individually, arranged in a manner so wholly unnatural. With them such a collection can be seen, and can only be seen, in the show-grounds of a florist, and affects them as an ordinary shop-window does us. In consequence, they more particularly affect the flowering-shrubs to a comparative neglect of the annuals. Perhaps nature has aided them to the custom by producing the

finest specimens of such shrubs to be seen anywhere in the world.

Scattered through the half garden, half park, are artificial ponds, called 'lotus-ponds,' set in a curbing of granite, with islands bordered in like fashion. In the same manner the brooks are confined and fringed, and are spanned by stone bridges at intervals; and yet so well done is the work that it seems in keeping with its surroundings. At all points where a particularly pretty bit of landscape presents itself, is found a summer-house; for a Korean does not combine the idea of exercise with the enjoyment of nature, and prefers to drink in the scenery where at the same time he can sip his tea.

Throw over the greater part of the scene the artistic touch of neglect and incipient ruin, and you have some idea of the grounds of the New Palace of Söul. PERCIVAL LOWELL.

THE YUCHI TRIBE OF INDIANS, AND ITS LANGUAGE.

THE ancient domain of the Yuchi or Uchee tribe on both sides of Middle Savannah River probably does not shelter any full-blooded Yuchi man or woman at the present time; but in the remote corner of the Indian Territory, where the tribe is settled now, it tenaciously clings to its ancient customs and habits, its beliefs, dances, and busk festivals. Very few of this aboriginal colony on the southern banks of the Arkansas River can converse intelligibly in English: they do not even mix a great deal with the Creeks, by whom they are surrounded on all sides, but live quietly and happily on their farms. Their myths consider the sun as a female, and the Yuchi as her children. When the last Yuchi dies, the whole world will become extinct also. The moon is regarded as of the male sex, and as the suitor of the sun.

Although the Yuchi tongue differs in its radicals from all American languages heretofore explored, it exhibits some general resemblance in structure to Creek and the other dialects of the Maskoki family. It is possessed of the same alphabetic sounds as this, but shows slight differences in their utterance, and is as prone to nasalize its vowels as Cha'hta and the Sioux dialect of Dakota. Syllables and words close with vowels almost throughout; and the structure of the syllable is, quite as invariably as in Ojibwē, one or two consonants followed by a vowel, diphthongs being rare and always adulterine. The mute consonants do not show the tendency of Creek to be uttered at the alveolar or front part of the palate. A large number of terms are oxytonized, that is, emphasized on their last syllable; but the Hottentot clucks, which have been attributed to the Yuchi language, do not exist in it. None of the nouns inflect for case. The adjective does not inflect for number; but the substantive nouns assume the ending *ha*, which I suppose to be abbreviated from *wahále* ('many'), a term which also appears as *hále*. The decimal system forms the base of the numeral series, and not the quinary, which is the most frequent one in America and in other parts of the world. The existence of a dual generally shows that a language has remained in a highly archaic state; but in Yuchi no trace could be discovered of it, neither in the noun or pronoun, nor in the verb, although the Maskoki dialects possess it in the latter. The verb has a personal and temporal inflection, but is not by any means so rich in tense forms as Creek, Cha'hta, or Hitchiti. But like these, it reduplicates the second syllable of the verbal base to form iterative, frequentative, and distributive forms of conjugation. In the third person of the pronoun, distinction is made not only between male and female, but also between races: since 'they,' when referring to whites or negroes of both sexes, is expressed by *lewénu;* when referring to Indians, by *lehénu.* 'She,' when pointing to an Indian woman not related to the one speaking, is rendered by *léno;* when related to him, by *lesséno.* All these gender distinctions are also expressed in the intransitive verb.

The gentes of the Yuchi people are identical with those of the Creeks and Seminoles, and, like the Náktche gentes, are evidently borrowed from them. The descent is therefore also in the maternal line. ALBERT S. GATSCHET.

RECENT INVESTIGATIONS UPON CHOLERA.

THE cessation of the cholera epidemic in Europe, since the advent of cold weather, has prevented the occurrence of much of interest in this direction since our last notice of the subject in *Science.* The English cholera commission, a note of whose labors was made some weeks ago (vol. v. p. 41), has returned, and has made a full report of its labors, which seem to contradict Koch's assertions in every vital point. We had hoped to receive the printed report before this, but have failed to do so as yet.

The most interesting work upon the comma bacillus of cholera, recently published, is that of Johne (*Zeitschr. f. thiermed.*, xi. 87), in which he gives the methods of culture, staining, and preparation of the

organism, and emphasizes its differences under cultivation from any of the other bacteria yet compared with it, paying especial attention to the bacillus of Finkler and Prior. To emphasize the difference still more, he gives figures illustrating the different appearances of the cultivations of the two organisms, and the different ways in which they liquefy the culture-material (*nahr-gelatin*). This work of Johne's is of such special interest just at present, that we feel justified in announcing that it may be purchased in separate form of C. W. Vogel, in Leipzig.

Buchner (*Münch. ärztl. intell.*, 1885, 549) finds a constant difference between Koch's and Finkler and Prior's organisms under cultivation, and adds his testimony to the effect that confusion of the two should be impossible. Doyen (*Soc. biol.*, Dec. 13, 1884) gives an account of various forms of bacteria, observed microscopically and under cultivation, in seven cases of cholera. These were found in the liver and kidneys; but as no data are given as to when the post-mortem examinations were made, how soon after death, etc., and as no inoculation experiments are as yet announced (as far as we have seen), the author is hardly justified, from these observations alone, in heralding 'the end of the reign of the comma bacillus.'

Pettenköfer's challenge to Koch, for it really amounts to that (*Deutsch. med. wochenschr.*, 1884, 818), has not yet been accepted, as, for various plain reasons, it probably will not be. This was, in effect, to produce twenty or one hundred volunteers besides himself as subjects for experimentation, to allow a preliminary gastro-intestinal catarrh to be produced, and then to swallow any reasonable amount of a pure culture of the cholera bacillus. Such a challenge as this may be effective, but naturally is not scientific for the reason that no such experiments can be carried on with precision.

Turning to subjects not immediately connected with the discussion of the specific bacterium of cholera, there have been some contributions to the literature of the subject worthy of attention. Villiers (*Comptes rendus*, 1885, 91) speaks of an alkaloid (ptomäine) found in the cadavers of two persons dead of cholera. It was found in notable quantity in the intestines, and in much less amount in the kidneys, liver, and heart's blood. It is liquid, has an acrid taste, and a distinct odor of hawthorn. It is alkaline, and an active base, set free by alkalies, but not by the alkaline carbonates. Iodide of mercury and of potassium give a white precipitate with its solutions and those of its salts. Picric acid gives a yellow, and chloride of gold a yellowish-white precipitate. Concentrated solutions give a white precipitate with tannin and bichloride of mercury, but chloride of platinum and bichromate of potash give no precipitate. Ferrocyanide and perchloride of iron give a very slight and slowly appearing precipitate. Sulphuric acid placed in contact with the alkaloid gives a very faint and quickly disappearing violet color. The chlorhydrate of the alkaloid is neutral to litmus-paper. It crystallizes in long fine transparent needles, which are exceedingly deliquescent.

Then follow certain physiological experiments, limited in number by the small quantity of the alkaloid at command. The effects produced were a remarkable variation of the pulse-beat, contractions of the limbs, anorexia, and death in four days, of the animal experimented upon (rabbit). Apparently the author did not look for the reproduction of the ptomäine in the body of this animal, — an experiment which would have been of interest as tending to show whether it were connected with the growth of any special micro-organism. The author proposes to continue his investigations as to the occurrence of other special alkaloids in acute diseases, especially in typhoid-fever. He offers a pregnant suggestion in this connection, that, if it turns out that these diseases terminate by the formation of these poisons (ptomäines) in the system, it may be possible to administer antidotes continuously until the cause of their production has disappeared, — thus, for cholera, the continuous administration of iodine-water to form an insoluble compound with the alkaloid; or, if this prove too irritating, the iodide of starch might be used.

Rivière (*Comptes rendus*, 1885, 157) gives a short statistical review of the cholera epidemic in Paris. From Nov. 4, 1884, to Jan. 15, 1885, the dates of the first case admitted and the last discharged from the Paris hospitals, there were 1,080 cases, — 636 males and 444 females. From these a small number must be deducted for errors of diagnosis. There were 587 deaths, or 54.15%. Of the men, 340 died, or 53.46%; and of the women, 247, or 55.63%. These figures reduce the percentage, as given in *Science* (v. 33), somewhat, but at the same time show that the mortality was no lower than usual in epidemics of cholera, and certainly not so low as has been indicated.

Pouchet (*Comptes rendus*, 1885, 220) speaks of the results of investigations upon the modifications undergone by certain secretions under the influence of cholera. He worked upon the bile, the dejections of the cold period, the urine, and the blood. He gives some further account of the ptomäine spoken of above, and a very interesting history of its poisonous effects upon himself during its preparation.

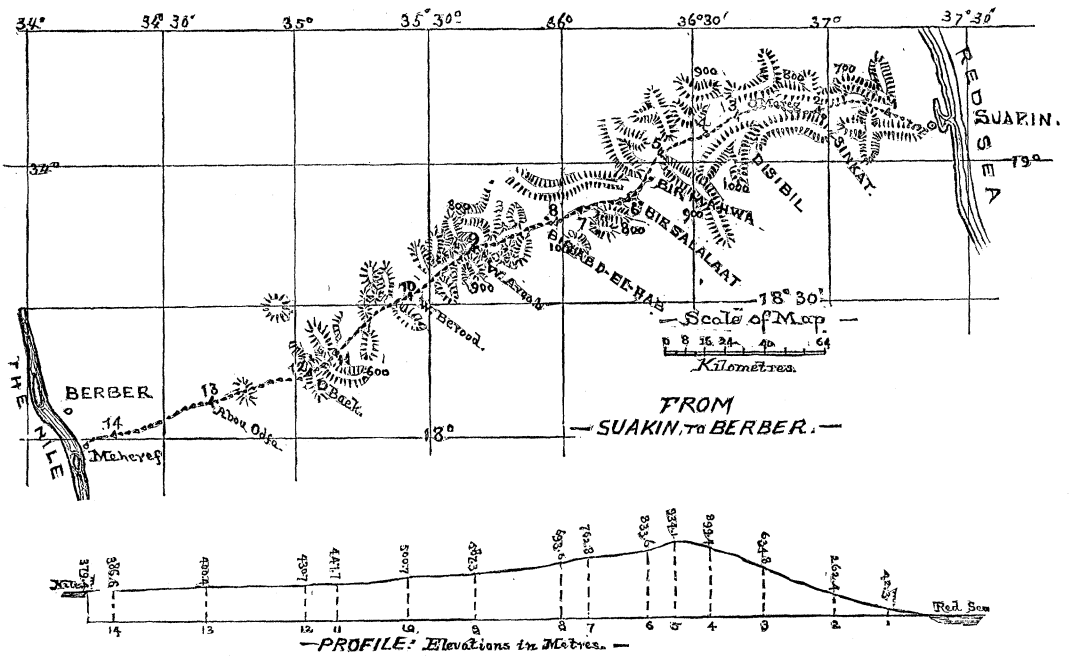
FROM SUAKIN TO BERBER.

SINCE the repulse of the English forces on the march to Khartum by the way of the Nile, attention has been drawn anew to the possibility of constructing and operating a railroad-line from Suakin to Berber. A line of some two hundred and fifty miles in length would easily bring the produce of the Sudan to a seaport. And the reasons why it has not been constructed heretofore are stated to be, that "Egypt had no navy. The khedive did not wish to put the key to the Sudan in the hands of the sultan, or of England, or Italy; nor did he wish the commerce of the Sudan to be diverted from the Nile valley." The military necessities of the situation have now, how-

ever, caused England to set about the undertaking; and work on the road has begun. The gauge, after some discussion of the relative merits of three feet, three feet six inches, and other widths, has been fixed at four feet eight inches and a half, probably with a view to permanency. It will be necessary to use iron sleepers, as the ants destroy wood rapidly.

The question of a water-supply on the route is a very important one. Col. H. G. Prout, an American engineer, formerly in the employ of the khedive under Gen. Stone as chief of the geographical and topographical section in the general staff bureau at Cairo, describes. From his communication the following points are condensed: —

Two miles inland from Suakin are wells which yield the only water for the town. For fifteen miles the route lies over a plain of gravel and small bowlders, and rises about eight hundred and fifty feet above the sea in that distance. A number of shallow beds of water-courses cross this plain, dry except for short and infrequent periods, as there is often no rain for two or three years. There is no vegetation, except some small acacias six to twelve feet high. In this distance wells are found at two places, each sufficient



contributes to the *Engineering news* of March 7, 1885, an account of a reconnoissance of the Suakin-Berber route made by him in April, 1875, and gives a map and profile of the route, the essential features of which are reproduced here. This profile is stated to be the first one published outside of Egypt; and the *Manchester guardian* speaks of his report as giving the best information possessed in regard to the line. The survey was made with care; the longitudes of the termini were taken from the best maps, and checked by chronometer; the latitudes were determined by his own observations; the line of the route was kept by prismatic compass-bearings and by marching-time; observations for altitude were made with two aneroid barometers, and carefully reduced. As the survey was made in April, and as there had then been no rain for two years, the English will now find much the same condition of things as that which he

for from three hundred to five hundred men and their animals. Then the line enters the mountains, and passes for five miles through a valley varying in width from one or two miles to the bowlder-bed of a mountain torrent. Here at Sinkat, a thousand feet above the sea, are the wells of Hambuk, — water-holes three feet deep, filling slowly, and kept drained by two hundred men and their horses, and three hundred camels. Thirty-two miles from Suakin is the divide between the valleys of Sinkat and O-Mareg, sixteen hundred feet above the sea, and presenting the first difficulty in building a railroad, as for some miles the pass is narrow and crooked, and the grades steep. Masonry to protect the road-bed from the torrent will be required, and rock-cutting may be necessary. The defile is a very bad one to pass in the face of an enemy. Thence the route lies through small valleys, with a growth of low trees and shrubs for

thirty miles, passing wells sufficient for one hundred or two hundred men only, and reaching, about sixty miles from Suakin, beyond Wady Ahmed, the summit of the line, three thousand feet above the sea, — a short but steep and narrow pass, and the most formidable obstacle on the route. Some heavy cutting will be unavoidable, unless another pass can be found. Wells at sixty-two and seventy-five miles from Suakin furnish a large quantity of good water. This portion of the route lies through barren, treeless valleys, strewn with fragments of trap and porphyry. At eighty-seven miles from Suakin is a steep, winding pass, altitude about twenty-five hundred feet above the sea, the last point offering any difficulty for a railroad. Nine miles beyond is the good well of Abd-el-Hab; and then, excepting two or three insignificant water-holes, we find only barren plains and low granite hills to Wady Ariab, — a hundred and eighteen miles from Suakin, and nineteen hundred feet above the sea. Here there is a genuine oasis, with good grazing. Twelve miles beyond, the mountains decline, and the route passes over barren plains for forty-two miles to the sand-dunes of O-Baek, about five miles across, where can be obtained a little water. In the preceding fifty-four miles there is no water. From O-Baek to the Nile, sixty-eight miles, stretches a stony plain without tree or herb, and with no water except at one good well two hours' march from the Nile. For seventy-five miles from Suakin, at no one point could a force of two thousand or three thousand men, with their animals, find sufficient water; and, after leaving Bir Ariab, there are two absolutely waterless stretches of fifty miles each.

To supply the water for the workmen while constructing this railroad, and for the troops which will be needed as guards, as well as to provide for the permanent working of the railroad, a pipe-line is at once to be laid, to consist of two lines of four-inch pipes, with stations every twenty-five or thirty miles, at which pumps will be connected with power sufficient to force the water, under a pressure of some one thousand to fifteen hundred pounds on the square inch at the pumps, so as to give a flow of about a hundred and fifty gallons per minute. The pipes will be laid in curves to allow for expansion from the excessive heat. The pumps are to be supplied by H. R. Worthington of New York, who has had great success in pumping petroleum through pipe-lines in this country under similar circumstances of distance and elevation to be overcome. In some cases their pumps have forced oil over a hundred miles without the assistance of intermediate stations. They are to be delivered in London in thirty days from the date of the order. It is also reported that the contract for laying the pipe has been offered to a New-York contractor of experience in that work, and that a man in Winnipeg, once an officer under Gen. Wolseley, and skilled in American methods of rapid railway-construction, has offered to build and guarantee the opening of the railroad from Suakin to Berber within five months from the signing of the contract.

Our enterprising countrymen are also urging upon the English government the advantages to be gained by the use, on the Nile, of the small, stern-wheel, light-draught steamboats so commonly employed on our western rivers. These boats are equipped with powerful capstans and warps for hauling them up rapids, as well as derricks for working off or over sand-bars, and can be rapidly built in the western yards and shipped in sections, or can be built abroad from plans.

THE TOPOGRAPHY AND GEOLOGY OF THE HUDSON-BAY REGION.

From Dr. Bell's report of the geological work of the Hudson-Bay expedition, we learn something respecting the topography and geological formation of that region. In passing northward along the Labrador coast, the land ascends until within seventy miles of Chudleigh, where a height of six thousand feet is reached: beyond this point it again descends gradually to the cape, which has an elevation of fifteen hundred feet. The highest land of the peninsula seems everywhere to lie close to the coast, with a gradual slope westward down to the comparatively flat basins of the Koksok, and the rivers emptying along the east coast of Hudson Bay. The coast of Labrador, like that of northern Europe, is indented by deep and narrow fiords, and in some places has shoals extending out about five miles. In the strait the coast-line appears to be less irregular, the coast is lower, the hills more rounded, and the country devoid of timber, of which the northern limit barely reaches Ungava Bay.

Throughout northern Labrador and the strait the formation is of gneiss, most of it Huronian, but some of it, perhaps, of Laurentian age, varying in color from gray to red, traversed at some points by dikes of trap, at others by veins of quartz, accompanied by the rock-formations usually found associated with such gneiss, and containing minerals characteristic of the formation, such as labradorite, anorthosite, calc-spar, iron-pyrites, and mica and felspar crystals. No economic minerals were found *in situ;* but at Ashe's Inlet some Eskimo from the eastward brought with them plates of good light-colored mica, pieces of pure foliated graphite, and one of amorphous graphite, all of which they said could be had in large quantities. On being shown specimens of minerals likely to occur in the formation, they recognized a bright-red hematite as existing inland, as well as a coarse variety of soapstone, which had been used for making pots; they also knew quartz, which they distinguished by its superior hardness from specimens of marble and gypsum shown them.

At Stupart's Bay, beaches of shingle may be seen at all levels, up to the tops of the highest hills in the vicinity, all as fresh-looking as those on the present shore, except that the stones are covered with lichens. At Port DeBoucherville the gneiss lies in island-like hummocks, the valleys being filled with bowlder-clay, which has a structural arrangement parallel to the walls, apparently due to a process of expansion, con-

traction, and heaving, in consequence of the severe frost. In narrow gorges this action had the effect of separating the bowlders from the clay, and throwing them to the centre into rows so regular as to suggest design. Mansfield Island is low, and, from disintegration of the rocks, looks like one gigantic ridge of gravel, the solid rock showing through the *débris* only at intervals. The formation is of gray limestone, in thin horizontal terraced beds, containing fossils, probably Silurian. Southampton Island is very similar, but appears to support a little more vegetation. At Marble Island, diorites and schists of the Huronian series are found; and the island probably derives its name from the white and light-colored quartzites of which the whole of the western part consists, and which bear a strong resemblance to white and veined marble. The surfaces of the beds are often strongly ripple-marked.

In considering the glaciation of the district, Dr. Bell remarks, that, if the sea here were only a hundred fathoms lower than at present, James and Hudson bays would be a plain of dry land, more level in proportion to its extent than any other on the continent. The numerous rivers that flow into it would traverse this plain, after having converged into one immense river towards the eastern limit of the plateau, and would empty into the strait near Digges, the strait remaining as a large bay, very much in its present shape.

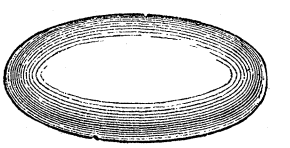
During the 'great ice age,' the basin of Hudson Bay may have formed a sort of glacial reservoir, receiving streams of ice from the east, north, and north-west, and giving forth the accumulated result as broad glaciers, mainly towards the south and south-west. In the strait, the direction of the well-marked glaciation is invariably eastward; and the composition of the drift, which includes Huronian limestone fragments similar to the more westerly formations, as well as the long depression of Fox's Channel and the strait, deepening as it stretches eastward, all point to the passage of an extensive glacier into the Atlantic. This glacier was probably joined by part of that occupying the site of Hudson Bay, and by another, also from the southward, coming down the valley of the Koksok River and Ungava Bay; these united streams still moving eastward, round Cape Chudleigh, into the ocean.

Throughout the drift-period, the coast-range of Labrador held its head above the ice, especially the high northern part; but, in going south, glacial action seems to have reached a height of a thousand feet at least. Here the course followed by the ice is down the valleys and fiords directly into the sea; while, on the island of Newfoundland, it appears to have been from the centre towards the sea, on all sides.

BIOLOGICAL NOTES.

ONE of the principal distinctions between the mammalia and the lower vertebrata has been hitherto supposed to be the possession by the former of a placenta. Duval, however (*Journ. anat. physiol.*, 1884, 193), has come to the conclusion that it also exists, though in a rudimentary form, in birds. The allantois, passing inward into the pleuro-peritoneal cavity, does not become attached to the amnion or the umbilical vesicle, but joins the chorion, becoming fused with it. It ends by forming a sac, which encloses a mass of albumen; and into this sac the villi of the chorion project, forming an organ completely analogous to the placenta of the mammalia. There is necessarily a difference in the form of this organ, due to the different modes of reproduction; in mammals the villi of the chorion being attached to the mother, while in birds they must attach themselves to the nutritive albumen. It is, however, quite intelligible, that in an ovoviviparous vertebrate, where the egg has a thin membranous shell, the placentoid organ should become attached to the internal surface of the oviduct. This placenta of birds is therefore a rudimentary organ which enables us to understand how the placenta of the mammalia may have originated.

For over sixty years Ornithorhynchus, or the duck-billed Platypus, has been believed to be oviparous; but up to the present time the evidence has not seemed to naturalists sufficient to settle this point beyond a doubt. In 1829 Geoffroy St. Hilaire, in a communication upon the subject, described the eggs as being of a regular oblong spheroidal form, of equal size at both ends, and measuring an inch and three-eighths in length and six-eighths of an inch in breadth.



It seems now to be established, that these eggs, two in number, are laid at the end of a burrow in the river-bank, about twelve yards from the water. The ovum of monotremes bears a close resemblance to that of a sauropsidan, and is very different from that of a true mammal, in that it has a good-sized yelk with which the young is nourished. It is interesting to observe that the yelk-sac and the umbilical vesicle are really homologous. In monotremes we find, as it were, intermediate animals possessing the attributes of two classes: for, on the one hand, they have developed mammary glands, the distinctive feature of the higher group; on the other, they lack that structure whereby the typical mammalian embryo receives nourishment before birth; and, in correlation with this, we find them agreeing with the lower class in the possession of a yelk-sac, whilst the contained food-yelk causes the ovum to assume the meroblastic type. We may thus trace the line of descent through the Sauropsida, directly to the monotremes (doubtless through forms extinct, as the Theromorpha of Cope); from these to marsupials, which are viviparous, but whose ova still possess a large yelk-sac, and whose embryos enter into no close vascular connection with the maternal tissues; and from these to the higher mammals.

In some experiments upon the digestion of sponges, von Lendenfeld kept some Australian Aplysinidae in

water containing powdered carmine. It was noticed, that, although all the cells took up the carmine, the epithelium of the ciliated chambers soon ejected the granules, while the cells of the upper surface of the subdermal cavity gave them off to the amoeboid wandering cells of the mesoderm, which, after they had partly digested the carmine, transmitted it to the cells of the ciliated chambers for ejection. He concluded, therefore, that although all the cells had the power of absorption, as is the case in man, still the digestive function in the species upon which he experimented was centralized in the upper wall of the subdermal cavities. Other authors have held different views; and in a subsequent paper he himself has concluded that it cannot yet be decided whether sponges digest with the ectoderm or the entoderm, though he considers it not improbable that both layers may have that function. His papers will be found in the Proceedings of the Linnean society of New South Wales.

R. von Lendenfeld has also described in the *Annals and magazine of natural history* for December, 1884, a new variety of Medusa which may prove to be a new species evolved within the last forty years. The species is Crambessa mosaica, which Huxley in 1845 described from Sydney, Australia, as blue to gray, but which is now found in this locality distinctly brown in color, due to a parasitic alga which infests the flesh near the surface. The evidence is sufficient to cause von Lendenfeld to state that it is probable that this new variety has been born since Huxley described it in 1845. He also mentions the case of another Medusa (Cyanea annaskala) which has hitherto been found only at Port Philip, where it is abundant, but which has recently been found at Port Jackson in warmer water. Those in the latter place differ from the typical species in being much larger, and, besides, in possessing deep-purple pigment-cells around the mouth-arms, which he thinks may be able to perceive light. He makes a new variety from this variation of color.

THE ANATOMY AND PHYSIOLOGY OF THE BRAIN IN THEIR RELATION TO MENTAL DISORDERS.

Treatises upon insanity have been appearing recently in quick succession, both in this country and abroad. There is none, however, which will command more notice, and prove more suggestive, than this work.

Professor Meynert, who has been at the head of the department of psychiatry in the University of Vienna for the past fifteen years, was one of the first to advance the opinion that a study of mental disease must be preceded by an understanding of healthy mental action. Regarding mental action as the subjective side of a physiological process in the brain, he seeks primarily to ascertain the function of the organ from its anatomical structure. The logical order which is followed in this work is therefore, first, the anatomy of the brain; second, the physiology of the brain, that is, the mechanism of mind; and, lastly, disturbances of the mechanism, that is, mental disorder.

The first volume is devoted to the structure and functions of the organ of mind. The position which Professor Meynert holds as the founder of modern brain-anatomy entitles him to a respectful hearing on this subject. Since the appearance of his first articles in Stricker's 'Handbook of histology' in 1870, he has been the chief authority in Germany; and almost every one of the younger scientific men who have done original work in this department has been imbued with his enthusiasm by personal contact with him in his laboratory. Within a hundred and twenty-five pages he has succeeded in giving a clear statement of the complex subject of the arrangement and relations of the gray masses and white connecting-fibres which make up the brain. An important aid to the comprehension of the structure will be found in the numerous excellent drawings of dissections and of microscopic sections.

The gray matter of the nervous system is the part in which sensory impulses are received and registered, and in which motor impulses are initiated. The white matter is made up of threads which transmit the impulses without modifying them. The structure and functions of the gray matter differ in different parts; simple functions being performed by that in the spinal cord, more complex functions in the gray masses within the brain, the most complex and the conscious functions being assigned to the layer which is spread out upon the surface of the brain, and which is thrown into folds by its convolutions. Each part of the surface of the body is in anatomical connection, by means of nerve-fibres, with its own part of the surface of the brain; and thus it is not difficult to imagine a projection of a map of the body upon the brain-cortex. The fibres which act in this manner to bring the external world into consciousness are named by Meynert 'the projection system of tracts.' This 'projection system' was announced in 1870, and was the starting-point to which all the recent discoveries regarding the localization of functions in various regions of the brain can be traced. It is to-day the ground-work for many arguments in favor of the theory of localization, — a theory to which Meynert gives his hearty support.

At present, investigations in brain-anatomy

Psychiatrie. Klinik der erkrankungen des vorderhirns begründet auf dessen bau, leistungen und ernährung. Von Dr. Theodor Meynert. Erste hälfte. Wien, *Braumüller*, 1884. 10 +288 p., illustr. 8°.

are directed to tracing the course of the tracts which unite the gray masses, and form the parts of the projection system. Owing to the discovery of new methods of investigation, progress has been rapid of late. It is not to be wondered at, therefore, that in regard to some details, the statements of Meynert, which were already in print three years ago, cannot now be accepted; e.g., as to the course of the lemniscus (pp. 94–97), and the connection of the tracts in the spinal cord with those in the cerebral axis (pp. 120–125). The diagram (fig. 58) is especially misleading. It is probably on account of these errors that an appendix is promised, to appear with the second volume, and to contain a review of the more recent discoveries. These minor defects do not, however, impair the usefulness of the work as a general text-book of brain-anatomy; and it is a matter of congratulation to those who are unable to master the very difficult style of the author, that an English translation is soon to appear.

It is by means of the projection system that impulses from without reach the brain-cortex, and become conscious perceptions. To associate these perceptions, and make connected thought possible, there exists a second system of fibres which unites the various regions of the brain-surface with each other. This is the 'association system.' Meynert illustrates the action of these systems by analyzing the simple act of winking. If a pin touches the eye of an infant, the lid closes. This is a reflex act, carried out by a simple mechanism independent of any act of consciousness; but, coincident with the reflex act; a number of impulses are sent along the projection fibres to the brain, which, on reaching the cortex, give rise to the conscious perception of the appearance of the pin, of the pain of the prick, and of the motion which has been performed. Each of these perceptions occurs in a different part of the brain, since each impulse reaches it by a different fibre. But the three occur simultaneously; and, as all parts of the cortex are joined by association fibres, the three perceptions are associated both in perception and in memory. Hence, when the pin is seen again, the memory of the pain arises, and also the memory of the motion which stopped the pain, and thus the mere sight of the object may lead the child to close the eye. The perception of the reflex motion has given the infant the knowledge of the possession of a muscle which will move; and the motion, having once become conscious, can be reproduced voluntarily by an effort which excites to action those cells which retain the memory of the motion (pp. 144–148). Every perception and motion has its appropriate cell; and, lest this should seem to demand too great a number of cells, Meynert has examined the cortex microscopically, and has found that it contains over a milliard of these bodies (p. 140). Each physiological action is attended by the acquisition of a new memory, and, as we go on in life, the number of cells unoccupied becomes less and less; so that it is probable that a physical limit to the power of memory, and consequently to the power of intellectual growth, is determined by the number of cells in the cortex (p. 140). This is the stand-point of an extreme materialist. But Meynert's materialism is not of the theoretical kind: it is based upon facts of observation which cannot be ignored. The structure of the brain, its comparative development in various species, the evolution of mind in animals, the growth of knowledge in children, the results of experimental physiology, and the symptoms of mental dissolution in a class of cases in which disease has reduced the individual to the level of the infant, or even to that of the brute, have been called on to furnish the data for Meynert's mechanism of thought. Psychologists are slowly coming to the conclusion that a wholly subjective method of research is inadequate to settle the questions which for so many years they have been unable to answer, and are beginning to pursue an objective method by studying the development of mind, and the disorders of mind which are associated with actual loss of brain-substance. To psychologists, therefore, this book is of great importance; for it opens up many new subjects, it throws light on many obscure subjects, it settles finally some disputed subjects.

Physiological processes are attended by the consumption of material: hence the nutrition of the brain enters as a factor in mental action. When a part of the brain is exercised, more blood passes to that part than to other parts to supply oxygen as it is needed. The rapidity and quality of the mental process is dependent to some degree upon the proper blood-supply. These are facts determined by experiment on animals and man. Mental labor is attended with a rise of temperature in the brain, an indication of increased oxidation processes. If a dog's brain is laid bare, the vessels are seen to be less distended with blood during sleep than when it is awake. If the dog dreams, the vessels dilate. An abnormal flow of blood to the brain interferes with the natural action of the organ: it may cause an irritation of the cells containing memory pictures, and consequently a conscious perception of the object

remembered by the cells, i.e., hallucinations. So, too, an abnormal lack of blood may exhaust the brain, may render a person incapable of carrying on mental processes, and may even cause such a degree of hunger for oxygen in the cells as in turn to produce irritation, and thus again hallucinations, followed by loss of memory. It is evident that Meynert regards many forms of mental disease as dependent upon abnormal nutrition of the brain, either from hyperaemia or anaemia, — a position in which he by no means stands alone.

The description of physiological processes in the brain forms a fitting introduction to the study of its disorders. This division of the subject is to be taken up in the second volume, which will be eagerly looked for by those who have read the first. It will doubtless be as suggestive and original as this volume.

Meynert's book should be read both by medical men and those interested in the problems of psychology. Its technical parts will be of great service to those who study the minute anatomy of the brain. Its physiological portion is of general interest, and will excite much notice and comment. The facts and the conclusions are entitled to careful consideration, as they are the product of most mature and thorough work, even though the materialistic explanation is at times inadequate. Meynert is not to be placed in the ranks of German philosophers. He does not grapple with the problems of psychology, as Lötze or Wündt have done: he writes from the stand-point of an alienist who seeks to resolve a mental process into its simplest elements, and to detect in any given case of mental disorder the particular element which is lacking. The explanation of the manner in which we acquire the idea of space is unsatisfactory (p. 166). The causal relation is not sharply differentiated from the simple association of ideas by correlation in time (p. 164). The time element in memory is not exhaustively discussed. There are, doubtless, many trains of thought which are largely the simple rising into consciousness of associated memory pictures. There are others which are not to be so easily accounted for, and to which no clew can be gained by a study of association fibres and of variations in the blood-supply. To the psychologist, therefore, this work will be of service only as a collection of facts in one department bearing upon his science, — facts which he must consider, but which by no means carry with them the explanation of the problems involved.

The work raises many questions which the author does not attempt to answer. It would perhaps be unjust to demand from him the attempt, for he does not pretend to be writing as a psychologist. As a study of thought-mechanism, and as an introduction to a study of psychiatry, to which alone it lays claims, it is more satisfactory than any work which has recently appeared.

ENGINEERING GEOLOGY.

It is now generally admitted by mining and civil engineers that a knowledge of the principles of practical geology is necessary for the successful execution of those plans, depending upon a correct conception and understanding of the character of the surface of the earth and underlying rocks, where engineering works, such as bridges, railroads, canals, and even buildings, are to be constructed, and through which, as in the case of railroad-tunnels and mines, excavations are to be made.

The rapid progress which has been made in America during the past fifteen years in practical geology has so completely absorbed the active professionalist, that none of our field-geologists have found time to contribute a treatise to our literature such as Geikie's Field, Penning's Engineering, and Page's Economic geology, Burat's 'Géologie appliqué,' and the more recent work by Wagner, on 'The relation of geology to the engineering sciences.'

This last work is an elaborate and strictly technical discussion of the application of practical geology to tunnel-work and closely related subjects. It contains superior plate (quarto photolithographs) and text illustrations, and will prove a work of great value, not only to professional field-geologists, but to students in practical geology and engineering, in defining some of the more useful and economically important applications of geology to engineering work.

Some of the geological cross-sections in the text clearly illustrate the geotectonic principles referred to, but evidently perpetuate an abominable custom, long since abandoned by the best American geologists, of exaggerating the vertical scale. The chapter on explorations by boring is not up to the standard of our home practice.

The practical examples cited from Wagner's own experience add much value and interest to the work, which would be more useful to

Die beziehungen der geologie zu den ingenieur-wissenschaften. Von C. J. Wagner, ober-ingenieur und sectionsleiter des Arlberg-tunnels. Wien, *Spielhagen & Schurich*, 1884. 88 p., 65 figs., 24 pl. 4°.

practising American engineers if in a more familiar language.

As stated in the preface, "der ingenieur muss geologische kenntnisse besitzen, aber braucht kein specialist zu sein." His eye should be trained to observe those phenomena which are of importance in determining the structure of rocks; but in special problems he must expect to consult the expert geologist, who will be able to deduce conclusions from data given him by the engineer.

MARTIN'S ELEMENTARY HUMAN PHYSIOLOGY.

AMONG the numerous recently published works of its class, the volume before us easily takes a very high rank. From the pen of a thoroughly trained instructor in biology, it is characterized by great clearness and precision of statement, and, being prepared with the co-operation of an experienced teacher of young pupils, the subject is presented in a simple and attractive way that cannot fail to interest the youthful reader. As an example of the way in which difficult points in anatomy and physiology are elucidated by reference to familiar facts, the following illustration of the protection which the skull affords the brain may be quoted: —

"If you turned upside down a thin china teacup, wrapped round it a covering of raw cotton, and over this put a thin casing of tough wood, any thing placed under the cup would be protected from blows, jars, and piercing, much as your brain is protected inside the skull."

The enactment in several states, of laws providing that the teaching of hygiene in the public schools shall include instruction in regard to the action of stimulants and narcotics, makes it incumbent upon all authors of text-books of hygiene to devote several chapters to this subject. Professor Martin has, upon the whole, accomplished this portion of his task in a very satisfactory manner, though some of his remarks will probably be read with surprise by practitioners of medicine. Thus we are told that 'the bromide is just as dangerous as the opiate,'—a statement which, however well adapted to accomplish the object of the author in discouraging the use of the drug without a physician's prescription, can hardly be regarded as a strictly accurate therapeutic guide.

The human body: a beginner's text-book of anatomy, physiology, and hygiene. By H. NEWELL MARTIN, D.Sc., M.A., M.D., professor of biology in the Johns Hopkins university, and HETTY CARY MARTIN. New York, *Holt*, 1884. 4+261 p., illustr. 8°.

The long list of diseases which may affect every organ and tissue of the body as the result of alcoholic indulgence is well calculated to strike terror to the heart of the toper, and rather tends to give this portion of the book the character of a temperance tract.

The illustrations are taken from Professor Martin's larger text-book of physiology, also entitled 'The human body,' and are therefore not always perfectly in harmony with the elementary character of the smaller work.

This defect is not, however, of any great importance, and does not prevent the work from being, upon the whole, the best English text-book for beginners in the sciences of which it treats.

NOTES AND NEWS.

THE annual stated session of the National academy of sciences will be held at the national museum in Washington, commencing Tuesday, April 21, 1885, at eleven A.M.

— The island of Formosa, which has recently been the scene of Franco-Chinese conflict, is stated, in Dr. S. Wells Williams's valuable work on China, to have been unknown to the Chinese before the year 1403, about the beginning of the Ming dynasty. As the mountains of Formosa are visible from the Chinese mainland in favorable weather, this appears due to some misconception, which is explained by Réné Allain. It appears, according to this author, who has recently published a work on Formosa, that, before the conquest of China by the Mongols (202 B.C.–226 A.D.), Formosa was already known, but under another name, to the Chinese historians, who counted its people among the 'Manti,' or southern barbarians. It was visited by the Chinese in the year 602, and was known as Liéu-Kiéu, or the Great Loo-Choo. Chinese colonies were established there in the fourteenth century. For two hundred years it took the name of Taï-wan, which it still bears in Chinese literature. In 1624 it was ceded by China to the Dutch, who were driven out in 1662 by a celebrated Chinese pirate known to Europeans as Koxinga, who maintained himself there for some twenty years. His successors made submission to the Chinese government, which subsequently made permanent colonies on the island. Formosa is about two hundred and forty-five miles long, with a greatest width of seventy-six miles. It has an area of some fifteen thousand square miles, and is separated from the mainland by a strait nowhere less than sixty miles wide. It is characterized by possessing a range of mountains of remarkable uniformity in height, and attaining a very exceptional altitude, the peaks ranging between eleven thousand and thirteen thousand feet. There are no good harbors, except for vessels of light draught, as far as known; and the land appears to be rising at a remarkable rate. The Dutch fort of 1624, originally built on an islet at some distance

from the shore, now forms part of Formosa, and under its ruins the water is so shallow that passengers land with much difficulty where was formerly deep water. The old harbor is now dry land, converted for miles into a plain, where was formerly the fine port of Taiwanfu. The island is very unhealthy for Europeans, and subject to earthquakes, but contains no active volcanoes.

— The veteran zoölogists of Cuba — Professor Felipe Poey, who is now nearly eighty-six years old, and Dr. Juan Gundlach, who has completed his seventy-fourth year — are still engaged industriously in studying the fauna of that tropical island. Dr. Gundlach has been publishing his contributions to the fauna of Porto Rico in the Annals of the Spanish society of natural history. The vertebrates (including fishes by Poey) have all appeared, and recently the fresh-water marine mollusca have been issued. Gundlach has been publishing every month eight octavo pages in the Annals of the Havana academy of sciences, — a contribution to the mammals, birds, and reptiles of Cuba, — and is now at work upon the insects, of which the Lepidoptera are almost completed, and occupy already nearly four hundred pages. Poey has published the fishes of the island in the Annals of the Spanish society of natural history, and Arango has discussed the mollusks. It is to be hoped that these still vigorous naturalists will live to see the completion of the work they have undertaken with so much zeal.

— The report of the librarian of Harvard university gives this year a fuller account than we have had before of Ebeling's collection of maps, which is known to be one of the most valuable collections in this country, especially for early maps of America. These maps have now been arranged with the others belonging to the university; and the whole series will occupy at least nine hundred portfolios, of which about three hundred and sixty pertain to America, counting in this seventy-two which hold the coast-survey maps. About one hundred volumes will be collected of maps which may be classed together for binding; and, when these are eliminated, there will still remain about fifteen thousand maps. The Ebeling maps belong principally to the seventeenth and eighteenth centuries, and were collected previous to 1817. The re-arranging will be completed early in the coming year. Meanwhile considerable progress has been made in a descriptive catalogue, written on slips which are kept in drawers near the cases of portfolios. These entries have been completed for the maps of Great Britain, France, Spain, Italy, and Scandinavia. When this catalogue is finished, an historical and topographical index is proposed. The maps in atlases will be eventually included, and perhaps important maps in geographical serials and other books. With this extent of catalogue and index service, it is not probable that questions of historical geography can be settled so well anywhere in this country as in the Harvard library.

— The death of Col. Roudaire of the French army, known so widely in connection with the project of an inland sea, to be artificially formed by flooding the depressed area of the 'chotts' in Algeria and Tunis, will not affect the continuation of the investigations relating to that enterprise. Col. Landas, professor of topography in the military school of St. Cyr, has volunteered to take the place of Roudaire. The latter, who had devoted himself with great energy to the scheme for twelve years, received no pecuniary reward for his labors, and leaves a mother, for whose support those interested have subscribed a little annuity.

— 'Melanic variation in Lepidoptera' was the subject of Lord Walsingham's presidential address before the Yorkshire naturalists' union on the 3d of this month. He calls attention to the prevalence of dark varieties of butterflies and moths at great elevations and high altitudes, and attempts to explain it on the theory of natural selection. He points out, that, while vertebrates living through the winter require to retain in their bodies a sufficient amount of heat to enable them to maintain their existence in the severest climates, insects require rapidly to take advantage of transient gleams of sunshine. "Those males," he says, "whose color enabled them to absorb the heat most rapidly would naturally be the first to harden their wings, and to acquire a degree of vitality sufficient to enable them to commence their flight. If we imagine the emergence of a pale and a dark variety side by side at the same moment, it is more than probable that the paler specimen would remain inactive among the herbage, when his darker companion had already commenced his flight. In unfavorable weather the degree of warmth sufficient to arouse even the darkest varieties might be of very short duration; and, if this were so, the less favored males might be wholly deprived of the degree of energy necessary to enable them to find their females. The shorter the continuance of passing gleams of sunshine, the greater would be the influences brought to bear against them; and each separate instance, however infrequent such instances might be, in which they were thus placed at a disadvantage, would have its effect in diminishing their numbers, promoting the survival of only the fittest forms. If this is so, it is sufficiently obvious that the first males on the wing have the best chance of transmitting their color by an hereditary process to the succeeding generation; and, if these males were always or usually the darkest of the brood, their progeny would also be for the most part dark." In order to test certain questions which would arise in connection with this, he placed several dark and light colored insects on the snow, and found a marked difference in the amount of absorption of heat from the sun, and in the rapidity with which they would make impressions upon the snow.

— The opening of the Antwerp exhibition, fixed for May 3, will have to be deferred, as the applications for space have been so numerous and extensive that the proposed area is insufficient.

— The following is a translation of the text of the regulations respecting vivisection issued by the Ger-

man government. 1°. Experiments on living animals must only be performed in serious investigations, or for purposes of instruction. 2°. In public lectures such experiments must not be performed, unless they are necessary for the full elucidation of the subject. 3°. The preparations, as a rule, must be made before the lectures begin, and not in the presence of the audience. 4°. The experiments must only be performed by qualified professors, or by their assistants on their responsibility. 5°. Experiments which will be equally satisfactory if performed on the lower species of animals must not be performed on the higher species. 6°. In all cases where the experiment can be performed without inconvenience under anaesthetics, anaesthetics must be administered.

— *Nature* states, that, in a paper read before the Statistical society on Feb. 17, Sir Richard Temple endeavored to check the various official returns of the population of China by applying the results obtained from the population statistics of British India. The various statements made by the Chinese government as to the numbers of people under its rule show violent fluctuations, those of the last century and a half varying between 436,000,000 and 363,000,000. These returns, as Professor Douglas pointed out, varied with the purposes for which the enumerations were made. China proper, and India, said Sir Richard Temple, have about the same area, — a million and a half of square miles. Both countries are under similar conditions, physical, technical, climatic, geographical. In both there is a strong tendency to multiplication of the race. In both the population loved to congregate in favored districts, to settle down and multiply there till the land could scarcely sustain the growing multitudes, and to leave the less favored districts with a scanty though hardy population. The average population of the whole of India is 184 to the square mile, and, if this average be applied to China (exclusive of the central plateau), it gives a population of 282,191,600 souls. The writer then compared, one by one, the eighteen provinces of China proper with the districts in India corresponding nearly in physical characteristics and cultivable area; and, summarizing these computations, he found, that, over a total area of 1,500,650 square miles, the population, according to this estimate from the Indian averages, would be 282,161,923, or, say, 183 persons to the square mile, while the latest official returns obtained from China show 349,885,386, or 227 inhabitants to the square mile. The general conclusion, he said, might be that the latest Chinese returns, though probably in excess of the reality, did not seem to be extravagant or incredible, on the whole, if tested by the known averages of the Indian census.

— Lebasteur has invented an ingenious process for determining the thickness of iron plates in boilers, or places where they cannot otherwise be measured without cutting them, which process is described in *Le génie civil.* He spreads upon the plate the thickness of which he desires to find, and also upon a piece of sheet-iron of known thickness, a layer of tallow about a hundredth of an inch thick. He then applies to each, for the same length of time, a small object, such as a surgeon's cauterizing instrument, heated as nearly as possible to a constant temperature. The tallow melts: and as in the thicker plate the heat of the cautery is conducted away more rapidly, while in the thin plate the heat is less freely conducted away, and the tallow is consequently melted over a larger area, the diameters of the circles of bare metal around the heated point, bounded after cooling by a little ridge of tallow, will be to each other inversely as the thickness of the plates. The process is stated to have given, in the inventor's hands, results of great accuracy.

— The approaching publication in Holland of a Dutch work on New Guinea by the former Dutch resident at Ternate, Mr. Van Braam-Morris, is announced. The work is to be edited by Mr. Robidée Van der Aa, who is himself an authority on the subject, and will be accompanied by a map. Mr. Van Braam-Morris succeeded in penetrating considerably to the south during an official tour on the Amberno or Rochussen rivers.

— At the February meeting of the Russian geographical society, Gen. Meyer read a paper on the transcaspian province, Merv, or Akhal-Téké. The paper did not mention any new facts, but dwelt on the barrenness of the country, and on its poor resources for trade, etc. The secretary mentioned the return of Poliakoff, who was present at the meeting, and the further progress of Potanin, who has traversed Ordoz, the country in the great bend of the Yellow River, China, and has found numerous ruins which testify that the country was formerly occupied by an agricultural people. The discussion of the Novaia Zemlia magnetic observations has been intrusted to Mr. Trautvetter, formerly director of the Pavlovsk observatory.

— Arrangements are in progress for a collection of live specimens of tropical fishes at the Indian and colonial exhibition of 1886. This scheme will involve the erection of tanks for the maintenance of water at far higher temperature than that suitable for fishes of the temperate zone.

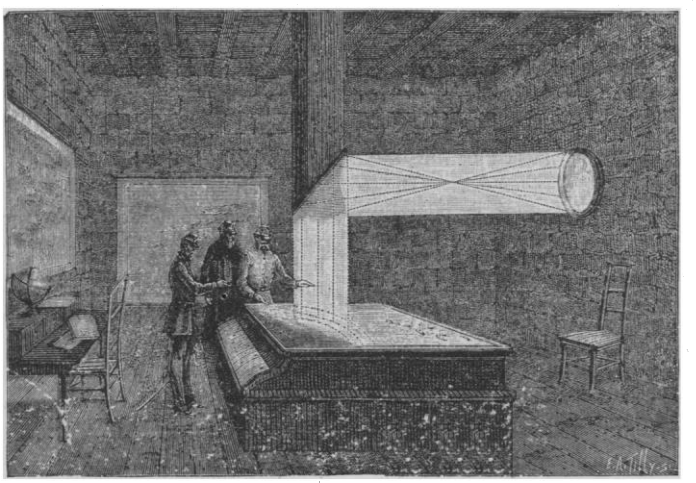
— The largest block of aluminum ever cast is made from American ore, and forms the apex of the Washington monument. It is nine inches and a half high, and measures five inches and a half on each side of the base, but weighs only one hundred ounces. The surface is whiter than silver, and is so highly polished that it reflects like a plate-glass mirror.

— There has recently been considerable agitation in Germany upon the smoke question; and some have suggested that government interfere, and establish 'stoker schools,' through which the stokers of all manufactories shall be obliged to pass before receiving a position. Besides this, it is urged that these manufactories be obliged to build high chimneys. *Engineering*, in a recent number, very sensibly remarks that such a system would be absurd, and further adds that there is no necessity for such action, for, as soon as the difficulties in the way of the introduction of electric lights into dwelling-houses are removed, the gas companies will be forced to reduce

their price; and then the system of gas-heating, which is now being agitated, will be introduced into houses, and finally, without doubt, into factories; and thus the system of pouring out immense quantities of smoke into the air of our cities will cease.

— Dr. Wiese, the German agricultural chemist, recently employed by the government to study suitable vegetables for cultivation in the sandy soil of East Prussia, left Berlin for the Cameroon coast during March. The object of his journey is to study the plants of the country, with a view to their cultivation in Germany.

— During the Austro-Italian war of 1866, in order to protect their ports from the attack of Italian ships, the Austrians placed torpedoes in many concentric circles near the mouths of the harbors. Each torpedo had a separate number, and was connected by a wire with the room represented in the accompanying illustration from *La Nature*, and each wire had a separately numbered key in this chamber. The building in which the chamber was situated was placed on the side of a hill, so as to overlook the port. The chamber was lighted only by a lens, which had a field covering the harbor. The rays of light coming from outside were then reflected into a prism which directed them down upon an unpolished glass plate placed horizontally upon a table, where an image of the harbor was formed. The black marks in the figure point out the exact place of each torpedo, and bear numbers corresponding to those on the keys. An employee watched the plate constantly, and observed every motion of approaching ships. By pressing a button he could at any time explode the corresponding torpedo.



AN AUSTRIAN PLAN FOR WATCHING THE MOVEMENTS OF VESSELS.

— The municipality of Paris has at last approved the suggestion of a grant of land for the new central laboratory of electricity, to be built out of the profits of the Paris electrical exhibition of 1881. These profits amounted to no less than $65,000.

— Among recent deaths we note the following: Mr. John Francis Campbell of Islay, in his sixty-fifth year; Mr. Thomas C. Archer, curator of the museum of science and art, Edinburgh; Mr. Poydessau, French engineer, at Panama, Jan. 7; Louis Godard, aeronaut; Rodolphe Meyer-Dur of Zurich, entomologist, March 2, in his seventy-fourth year; Dr. Julius Münter, director of the botanic garden of Greifswald, Feb. 2; Dr. J. C. G. Lucae, anatomist and anthropologist, at Frankfort a.-M., Feb. 3; H. W. Blair, assistant in the U. S. coast and geodetic survey, at Nashville, Tenn., Dec. 15.

— The Dollfus prize of the Entomological society of France was awarded, on Feb. 25, to Mr. Léon Fairmaire, for his work on the Hemiptera of France.

— The first number of *Mind in nature*, which is 'to furnish in a popular manner information regarding psychical questions,' appeared this month. Those who are willing to accept the marvellous on the slightest evidence will take pleasure in reading the article on metaphysics, by Bishop Samuel Fellows, and that on Christian science, by Dr. S. J. Avery. The article on presentiments is of the same unconvincing character. A paper by Oliver J. Lodge, on experiments in thought-transference, with one or two by Edmund Gurney and others, are reprinted from the Proceedings of the English society for psychical research.

— In No. 180 of the *Zoologischer anzeiger* there are some interesting notes upon spiders by F. Dahl. He claims that their sight is imperfect, except at very short distances; and, in consequence of this, their sense of touch is so well developed, that, when an object falls into their net, they can tell upon exactly which radius the object has fallen, though to ascertain this they must first go to the centre of the web, even though the object may have fallen near their original position. Their smell and hearing are also excellent, the former so much so that they can distinguish odors. The remarkable instinct possessed by the geometrical spiders is shown by the fact that the first web made by the young is perfectly geometrical. That they reflect, is proved by the fact that they despise certain kinds of tough, chitinous insects, which they have unsuccessfully attacked before. This reflection is to be distinguished from the instinctive dread which they have for bee-like flies.

— Prof. S. P. Langley sailed on Wednesday for England, to lecture before the Royal institution.